AF/
IFW

Docket No.: M4065.0369/P369
(PATENT)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:
Shane J. Trapp

Application No.: 09/752,685

Confirmation No.: 9753

Filed: January 3, 2001

Art Unit: 2813

For: METHOD FOR FORMING A CONTACT OPENING IN A SEMICONDUCTOR DEVICE

Examiner: J. S. J. Chen

APPEAL BRIEF

MS Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

This brief is being filed within one month from the mailing of the Notice of Panel Decision from Pre-Appeal Brief Review, mailed on August 8, 2006, and is in furtherance of the Notice of Appeal filed on June 22, 2006.

The fees required under § 41.20(b)(2) are dealt with in the accompanying TRANSMITTAL OF APPEAL BRIEF.

This brief contains items under the following headings as required by 37 C.F.R. § 41.37 and M.P.E.P. § 1206:

I. REAL PARTY IN INTEREST

The real party in interest for this appeal is MICRON TECHNOLOGY, INC., the assignee of the application.

II. RELATED APPEALS, INTERFERENCES, AND JUDICIAL PROCEEDINGS

There are no other appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in this appeal.

III. STATUS OF CLAIMS

A. Total Number of Claims in Application

There are 41 claims pending in the application.

B. Current Status of Claims

1. Claims canceled: 14, 26-35, 40, and 47-63

2. Claims withdrawn from consideration but not canceled: 1-13, and 15-25

3. Claims pending: 36-39, 41-46, and 64-70

4. Claims allowed: None

5. Claims rejected: 36-39, 41-46, and 64-70

C. Claims On Appeal

The claims on appeal are claims 36-39, 41-46, and 64-70

IV. STATUS OF AMENDMENTS

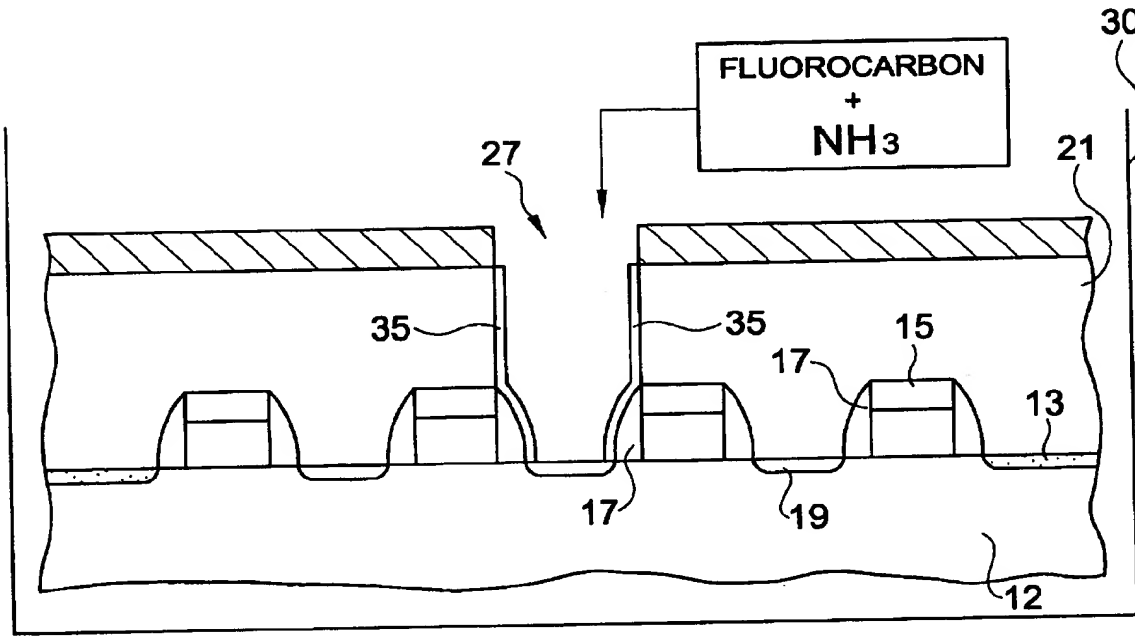
There have been no amendments filed subsequent to the March 22, 2006 Rejection.

V. SUMMARY OF CLAIMED SUBJECT MATTER

The claimed invention relates to a method of etching a contact opening in a semiconductor device using a plasma etchant mixture consisting essentially of ammonia and at least one fluorocarbon. The particular combination of ammonia and at least one fluorocarbon with specific flow rates substantially reduces or eliminates the formation of an etch stop. In addition, the claimed combination forms a protective layer that prevents erosion of the sidewall spacer when a contact opening is formed. (Abstract). FIG. 3 from the present application is reproduced below to better explain

the claimed subject matter.

FIG.3

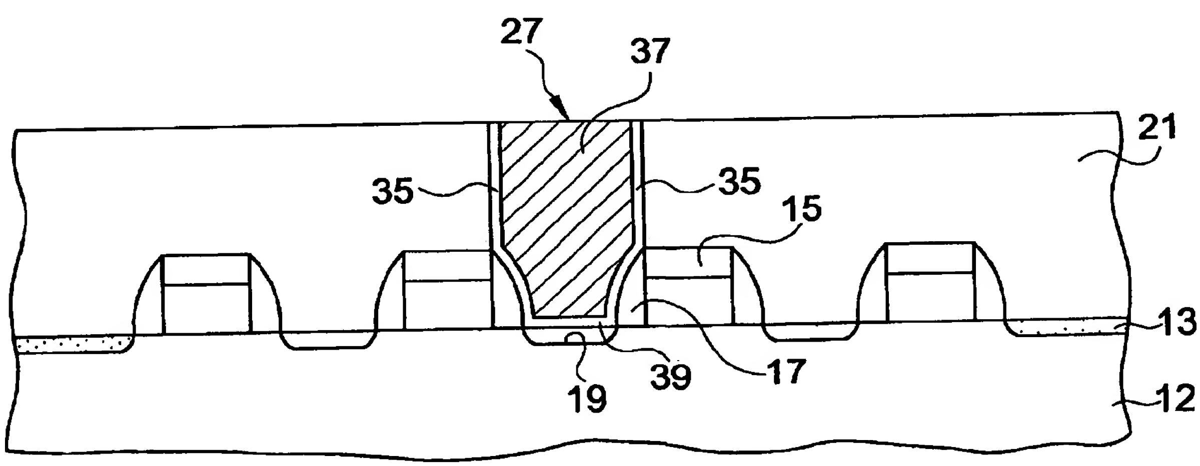


Claim 36 is drawn to a process for forming an opening 27 in an insulative layer 21 formed over a substrate 12 in a semiconductor device. The process comprises forming a pair of adjacent gate stacks 15 over the substrate 12. One such pair of gate stacks are shown located on either side of the opening 27. The process also comprises forming sidewall spacers 17 on sidewalls of said adjacent gate stacks, forming an insulative layer 21 over said substrate 12, forming a patterned photoresist mask layer (shown in FIG. 3 as the striped layer) over the insulative layer 21, and etching an opening 27 in the insulative layer 21 defined at least in part by said sidewall spacers 17 through an aperture in said patterned photoresist layer. The opening is etched through to the substrate 12 using a combination consisting essentially of ammonia and at least one fluorocarbon, wherein the at least one fluorocarbon is selected from the group consisting of C_4F_8, C_4F_6, C_5F_8, CF_4, C_2F_6, CHF_3, CH_2F_2 and C_3F_8. The flow rate ratio of the

at least one fluorocarbon to the ammonia is from about 2:1 to about 40:1, and the step of etching an opening in the insulative layer 21 forms a protective layer 35 on the sidewall spacers 17 that is from about 5 to about 50 Å thick. (Specification, paragraph [0027]). "The protective layer 35 is a polymeric material formed as a result of the reaction between the reactant mixture and the insulative layer and the side wall spacers, respectively. Formation of this protective layer 35 helps to prevent erosion and destruction of the sidewall spacers during the etching process and thereafter, and is therefore desirable." (Specification, paragraph [0027]).

FIG. 4 from the present application is reproduced below to better explain the claimed subject matter of claim 64, in which, after formation of opening 27, the opening is filled with a conductive plug 37.

FIG.4



Claim 64 is drawn to a method of forming a conductive plug 37 between adjacent gate stacks 15 with sidewall spacers 17 and inside a self-aligned contact opening 27 formed in an insulative layer 21 provided over a substrate 12 in a semiconductor device. The method comprises contacting the insulative layer 21 with a plasma etchant mixture consisting essentially of ammonia and at least one fluorocarbon at a temperature within the range of from about -50 to about 80 degrees Celsius so as to form a self-aligned contact opening 27 defined at least in part by said sidewall spacers 17 on adjacent gate stacks in said insulative layer 21 without an etch stop. The contacting further forms a protective layer 35 over opposed sidewall spacers 17, which have been formed over the adjacent gate stacks 15, that is from about 5 to about 50 Å thick. The flow rate ratio of the at least one flurocarbon to the ammonia is from about 2:1 to about 40:1, and the flow rate of the ammonia is at least about 2 sccm (standard cubic centimeters per minute). The method further comprises depositing a conductive plug 37 inside said etched opening 27 such that the conductive plug is separated from the sidewall spacers 17 by the protective layer 35. (Specification, paragraph [00029]).

Claim 66 is dependent on claim 64 and recites that the at least one fluorocarbon is at least one member selected from the group consisting of C_4F_8, C_4F_6, C_5F_8, CF_4, CHF_3, and CH_2F_2 and is flowed over the device at a flow rate within the range of about 10 sccm to about 45 sccm. (Specification, paragraphs [0018] and [0022]).

Claim 67 is dependent on claim 66 and recites that the mixture comprises at least two fluorocarbons and the flow rate ratio of each fluorocarbon to ammonia is within the range of about 3:1 to about 20:1. (Specification, paragraph [0021]).

Claim 68 is dependent on claim 67 and recites that the mixture comprises three fluorocarbons and the flow rate ratio (of each fluorocarbon to ammonia) is within the range of about 4:1 to about 10:1. (Specification, paragraph [0021]).

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

The grounds of rejection to be reviewed on appeal are the rejection of claims 36-39, 41-46, and 64-70 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,140,168 issued to Tan et al. ("Tan") in view of U.S. Patent No. 5,814,563 issued to Ding et al. ("Ding") as stated in the March 22, 2006 Rejection.

VII. ARGUMENT

A. The subject matter of Claims 36, 37, 38, 39, 41, 42, 43, 44, 45 46, 64, 65, 66, 69, and 70 would not have been obvious over Tan in view of Ding.

1. Tan combined with Ding renders Tan unsatisfactory for its intended purpose

Independent claim 36 is drawn to a process for forming an opening in an insulative layer formed over a substrate in a semiconductor device, where the process comprises forming a pair of adjacent gate stacks over said substrate; forming sidewall spacers on sidewalls of said adjacent gate stacks; forming an insulative layer over said substrate; forming a patterned photoresist mask layer over said insulative layer; and, etching an opening in said insulative layer defined at least in part by said sidewall spacers through an aperture in said patterned resist layer, wherein said opening is etched through to said substrate using a combination consisting essentially of ammonia and at least one fluorocarbon, wherein said at least one fluorocarbon is selected from the group consisting of C_4F_8, C_4F_6, C_5F_8, CF_4, C_2F_6, CHF_3, CH_2F_2 and C_3F_8, and wherein the flow rate ratio of said at least one fluorocarbon to said ammonia is from about 2:1 to about 40:1, and wherein the step of etching an opening in said insulative layer forms a protective layer on said sidewall spacers that is from about 5 to about 50 Å thick.

Independent claim 64 is drawn to a method of forming a conductive plug between adjacent gate stacks with sidewall spacers and inside a self-aligned contact

opening formed in an insulative layer provided over a substrate in a semiconductor device, where the method comprises contacting said insulative layer with a plasma etchant mixture consisting essentially of ammonia and at least one fluorocarbon at a temperature within the range of from about -50 to about 80 degrees Celsius so as to form a self-aligned contact opening defined at least in part by said sidewall spacers on adjacent gate stacks in said insulative layer without an etch stop, wherein said contacting further forms a protective layer over opposed sidewall spacers which have been formed over said adjacent gate stacks that is from about 5 to about 50 Å thick, wherein the flow rate ratio of said at least one flurocarbon to said ammonia is from about 2:1 to about 40:1, and said flow rate of said ammonia is at least about 2 sccm; and, depositing a conductive plug inside said etched opening such that said conductive plug is separated from said sidewall spacers by said protective layer.

The March 22, 2006 Rejection states that it would have been obvious for one skilled in the art to modify the process of Tan by using the plasma etchant mixture taught by Ding to etch the self-aligned contact with a better etch rate and improved etch selectivity without an etch stop. (March 22, 2006 Rejection, page 4-5). Appellant respectfully disagrees and traverses this argument. As described below, combining Tan with Ding would render Tan unsatisfactory for its intended purpose. It is well settled that if proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification. *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984). This is the case we have here.

FIG. 1C and FIG. 1D from Tan are reproduced below to better explain the disclosure of Tan. The intended purpose of the method of Tan is to fabricate a self-aligned contact window in a dielectric layer. (Tan, abstract). Tan accomplishes this by implanting ions into the dielectric layer 114a through an opening 120 in a photoresist 116. (Tan, FIG. 1C). The doped region of the dielectric layer is then removed by etching with a mixture of etching reactive etching gases that "consist of methyl trifluoride (CHF3), carbon tetrafluoride (CF4), and argon (Ar)." (Tan, column 3, lines 45-47). The etching process taught by Tan is controlled by the etching selectivities of the materials to be etched. Tan discloses that "the etching process for the self-aligned contact window 124 can be smoothly performed due to the etching selectivities of the dielectric layer 114a, the cap layer 106, and the spacer 108" (Tan, column 3, lines 52-55) and that "the recipe of the etchant has a higher etching rate for the silicon oxide layer serving as a dielectric layer than for the silicon nitride layer used for the spacer and the cap layer, the etching rate of the spacer and the cap layer can be ignored and the etching process stops on the spacer and the cap layer." (Tan, column 2, lines 27-32). Therefore, according to Tan, the Tan etching process <u>requires</u> the use of an etchant that will etch the silicon oxide of the dielectric layer 114a, but will not etch the silicon nitride of the spacer 108 and the cap layer 106 so that the etching process automatically stops at the spacer 108 and the cap layer 106. (Id.)

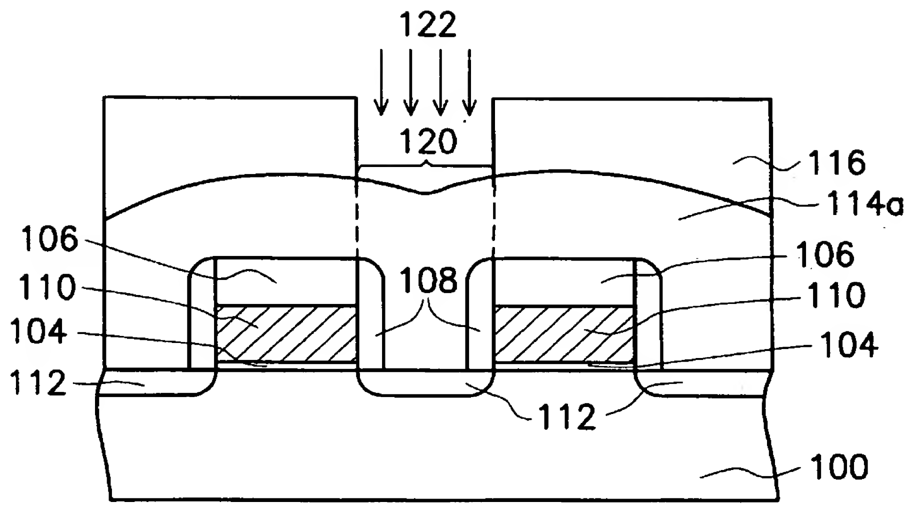

122
120
116
114a
106
110
104
112
108
106
110
104
112
100

FIG. 1C

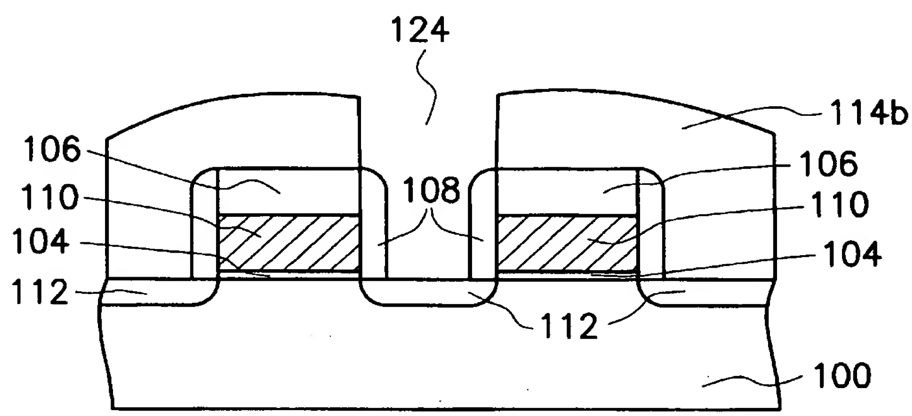

124
114b
106
110
104
112
108
106
110
104
112
100

FIG. 1D

Ding, on the other hand, teaches a plasma etchant mixture that provides "unexpectedly high dielectric etch rates" (Ding, column 2, lines 52-53) used to etch a dielectric 20 on a substrate 25. (Ding, column 5, lines 45-47 and FIG. 1b). The plasma etchant mixture of Ding includes a "NH_3-generating gas for enhancing the etching rates . . . by adsorping onto the surface of the substrate. (Ding, column 5, lines 51-53). Ding teaches "forming a plasma from the process gas <u>to etch the silicon oxide or silicon nitride layers</u> at an etch rate of greater than 600 nm/minute." (Ding, column 14, lines 49-52, (emphasis added)). It is clear that the etchant taught by Ding is designed to etch through silicon nitride. Therefore, combining the etchant of Ding with the process of Tan would necessarily render the process of Tan unsuitable for its intended purpose because the etchant taught by Ding would destroy the Tan spacer 108 and cap layers 106 which are formed of silicon nitride.

Accordingly, this is one reason why the rejection of claims 36, 37, 38, 39, 41, 42, 43, 44, 45 46, 64, 65, 66, 69, and 70 should be reversed.

2. Tan teaches away from combination with Ding

Appellant respectfully submits that Tan is not properly combinable with Ding because Tan teaches away from the cited combination. The federal circuit has held that it is improper to combine references where the references teach away from their combination. *In re Grasselli*, 713 F.2d 731, 743, 218 USPQ 769, 779 (Fed. Cir. 1983).

Tan teaches a method of etching in which "the recipe of the etchant has a higher etching rate for the silicon oxide layer serving as a dielectric layer than for the silicon nitride layer used for the spacer and the cap layer, the etching rate of the spacer and the cap layer can be ignored and the etching process stops on the spacer and the cap layer." (Tan, column 2, lines 27-32). Therefore, Tan teaches away from changing the recipe of the etchant. Furthermore, Tan teaches away from using an etchant that

will etch through both silicon oxide and silicon nitride because the etchant used by Tan must etch through the dielectric layer, but not through the spacer and the cap layer.

Ding, on the other hand, teaches "forming a plasma from the process gas to etch the silicon oxide or silicon nitride layers at an etch rate of greater than 600 nm/minute." (Ding, column 14, lines 49-52). It is clear that the etchant taught by Ding is designed to etch through both silicon nitride and silicon oxide. Therefore, Tan is not properly combinable with Ding because Tan teaches away from using an etchant that will etch through both silicon oxide and silicon nitride such as the etchant taught by Ding.

Accordingly, this is another reason why the rejection of claims 36, 37, 38, 39, 41, 42, 43, 44, 45 46, 64, 65, 66, 69, and 70 should be reversed.

3. Tan in view of Ding does not teach all the recited elements of the claims.

Appellant further submits that the March 22, 2006 Rejection has failed to make a *prima facie* case for obviousness because Tan in view of Ding, even if they are properly combinable, does not teach or suggest that "the step of etching an opening in . . . [the] insulative layer forms a protective layer on . . . [the] sidewall spacers that is from about 5 to about 50 Å thick," as recited in independent claim 36 or that the "contacting further forms a protective layer over opposed sidewall spacers which have been formed over said adjacent gate stacks that is from about 5 to about 50 Å thick" as recited in independent claim 64. "To establish a prima facie case of obviousness...the prior art reference (or references when combined) must teach or suggest all the claim limitations." *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

The November 16, 2005 Rejection acknowledges that Tan in view of Ding does not disclose the recited thickness of the protective layer. Instead, the November 16, 2005 Rejection contends that "the specification does not disclose anything critical regarding this particular thickness ranges; therefore, this particular range is considered as routine optimization (November 16, 2005 Rejection, page 8). Appellant respectfully traverses this argument.

The thickness of the protective layer is critical to the usefulness of the claimed protective layer. For example, the specification at paragraph [0027] states that "[f]ormation of this protective layer 35 helps to prevent erosion and destruction of the side wall spacers during the etching process and thereafter, and is therefore desirable. The protective layer 35 is typically on the order of just a few Angstroms in thickness, e.g. about 5-50 Angstroms." It is therefore clear that the proper thickness is critical to the usefulness of the protective layer because if the protective layer were too thin, it would not "prevent erosion and destruction of the sidewall spacers" and if the protective layer were too thick, it would impede the etching process by forming an etch stop. (Id.)

Furthermore, the March 22, 2006 Rejection acknowledges that Tan does not teach "forming a protective layer over the opposed side wall spacers of the adjacent gate stacks." (March 22, 2006 Rejection, page 3). Moreover, Ding does not teach or suggest forming a protective layer "over opposed sidewall spacers," as recited in claims 36 and 64, but rather, teaches forming a passivating deposit 46 on the side of the dielectric layer 20 that is being etched. Therefore, if using the etchant taught by Ding in the process taught by Tan resulted in a polymeric coating formed on the sidewall spacers, there would be no motivation to optimize the thickness of the coating on the sidewall spacers to achieve any particular thickness because neither Tan nor Ding

disclose a need for a coating on sidewall spacers. "The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art and not based on applicant's disclosure." In re Vaeck, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

Accordingly, this is another reason why the rejection of claims 36, 37, 38, 39, 41, 42, 43, 44, 45 46, 64, 65, 66, 69, and 70 should be reversed.

B. The rejection of Claim 67 should be reversed.

1. Claim 67 depends from claim 66

Claim 67 depends from claim 64 and is therefore allowable for at least the same reasons as discussed above with regard to claim 64.

2. Tan in view of Ding does not teach all the recited elements of claim 67.

The March 22, 2006 Rejection has failed to make a prima facie case for obviousness regarding claim 67 because Tan in view of Ding, even if properly combinable, does not teach or suggest that "said mixture comprises at least two fluorocarbons and said flow rate ratio of each said fluorocarbon to said ammonia is within the range of about 3:1 to about 20:1."

The March 22, 2006 Rejection states that "Tan et al does not teach...using the plasma etchant mixture essentially consisting of ammonia and said fluorocarbon of a ratio flow rate of the fluorocarbon to ammonia of 2:1 to 40:1." (March 22, 2006 Rejection, page 3). The March 22, 2006 Rejection does not describe how Ding cures the deficiency of Tan with regard to claim 67, but states that Ding teaches a "flow rate ratio of the fluorocarbon to ammonia of 2:1 to 40:1." (March 22, 2006 Rejection, page 4). However, the March 22, 2006 Rejection does not specify where Ding teaches this

limitation and the Appellant cannot find this teaching within Ding. At best, Ding teaches that the flow ratio of <u>one</u> fluorocarbon (CHF_3) to ammonia may be from about 2.5:1 to about 7.5 to 1. (Ding, column 7, lines 13-15). However, Ding does not teach a flow rate ratio for two fluorocarbons used together with ammonia where the flow rate of <u>each</u> fluorocarbon to ammonia is within the range of about 3:1 to about 20:1.

Instead, in Ding Example 1, Ding teaches that a "process gas comprising 40 sccm CHF_3, 11 sccm NH_3, 11 sccm CF_4, and 80 sccm Ar." (Ding, column 11, lines 43-45). Ding states that the "gas composition used a CHF_3 :NH_3 flow ratio of about 4:1." (Ding, column 11, lines 43-45). The flow ratio of CF_4 :NH_3 can easily be calculated as 11 sccm : 11 sccm or 1:1, which falls outside the claimed range.

In Ding Example 2, Ding teaches that the "process gas comprised 55 sccm CHF_3, 11 sccm NH_3, 11 sccm CF_4, and 80 sccm Ar." (Ding, column 11, lines 43-44). Ding states that the "gas composition had a CHF_3 :NH_3 ratio of about 5:1." (Ding, column 11, lines 44-45). The flow ratio of CF_4 :NH_3 can easily be calculated as 11 sccm : 11 sccm or 1:1, which falls outside the claimed range.

In Ding Example 3, Ding teaches that a "process gas comprising 33 sccm CHF_3, 11 sccm NH_3, 5 sccm CF_4, and 66 sccm Ar, was used." (Ding, column 12, lines 3-5). Ding states that the "gas composition provided a CHF_3 :NH_3 flow ratio of about 3:1." (Ding, column 12, lines 4-5). The flow ratio of CF_4 :NH_3 can easily be calculated as 5 sccm : 11 sccm or 0.45 :1, which falls outside the claimed range.

In Ding Example 4, Ding teaches that a "process gas comprised 40 sccm CHF_3, 11 sccm NH_3, 40 sccm CO, 11 sccm CF_4, and 80 sccm Ar." (Ding, column 12, lines 26-28). Ding states that the "gas composition provided a CHF_3 :NH_3 ratio of about 4:1."

(Ding, column 12, lnes 27-28). The flow ratio of CF_4 :NH_3 can easily be calculated as 11 sccm : 11 sccm or 1:1, which falls outside the claimed range.

Therefore, Ding does not teach or suggest that "said mixture comprises at least two fluorocarbons and said flow rate ratio of each said fluorocarbon to said ammonia is within the range of about 3:1 to about 20:1" as recited in claim 67.

Accordingly, this is a reason why the rejection of claim 67 should be reversed.

C. Claim 68

1. Claim 68 depends from claim 67

Claim 68 depends from claim 67, which depends from claim 66, which depends from claim 64 and is therefore allowable for at least the same reasons as discussed above with regard to claims 64, 66, and 67.

2. Tan in view of Ding does not teach all the recited elements of claim 68.

The March 22, 2006 Rejection has failed to make a *prima facie* case for obviousness regarding claim 68 because Tan in view of Ding, even if properly combinable, does not teach or suggest at least that "said mixture comprises three fluorocarbons and said flow rate ratio is within the range of about 4:1 to about 10:1."

Similarly to claim 67 discussed above, the March 22, 2006 Rejection does not describe how Ding cures the deficiency of Tan with regard to claim 68. In fact, Ding does not teach flow rate ratios for any composition containing three fluorocarbons.

Accordingly, this is a reason why the rejection of claim 68 should be reversed.

CONCLUSION

For each of the foregoing reasons, Appellant respectfully submits that the claimed subject matter is not unpatentable over the cited combination. Appellant respectfully requests the reversal of the final grounds of rejection.

Dated: September 8, 2006

Respectfully submitted,

By ______________________

Thomas J. D'Amico
Registration No.: 28,371
David T. Beck
Registration No.: 54,985
DICKSTEIN SHAPIRO LLP
1825 Eye Street, NW
Washington, DC 20006-5403
(202) 420-2200
Attorneys for Appellant

VIII. CLAIMS APPENDIX

Claims Involved in the Appeal of Application Serial No. 09/752,685

1. (Withdrawn) A method of forming a contact opening in an insulative layer formed over a substrate in a semiconductor device, said method comprising:

etching said insulative layer with an etching composition consisting of ammonia and at least one fluorocarbon so as to form said contact opening, wherein the flow rate ratio of said at least one fluorocarbon to said ammonia is from about 2:1 to about 40:1, and said flow rate of said ammonia is in the range from about 2 sccm to about 6 sccm.

2. (Withdrawn) The method of claim 1, wherein said method is performed to produce a self-aligned contact opening, said opening is self-aligned between two adjacent gate stack structures with side wall spacers.

3. (Withdrawn) The method of claim 1, wherein said etching includes plasma etching.

4. (Withdrawn) The method of claim 3, wherein said etching is performed within a temperature range of about -50 to about 80 degrees Celsius.

5. (Withdrawn) The method of claim 4, wherein said etching is performed within a temperature range of about 0 to about 50 degrees Celsius.

6. (Withdrawn) The method of claim 4, wherein said etching is performed at an operating pressure of about 25 to about 60 milliTorrs.

7. (Withdrawn) The method of claim 4, wherein said etching is performed at an operating pressure of about 40 to about 50 milliTorrs.

8. (Withdrawn) The method of claim 1, wherein said etching is performed through a patterned photoresist mask.

9. (Withdrawn) The method of claim 1, wherein said at least one fluorocarbon is at least one member selected from the group consisting of fluorinated carbons, fluorohydrocarbons, chlorofluorocarbons and chlorofluorohydrocarbons.

10. (Withdrawn) The method of claim 9, wherein said at least one fluorocarbon is at least one member selected from the group consisting of C_4F_8, C_4F_6, C_5F_8, CF_4, C_2F_6, C_3F_8, CHF_3, and CH_2F_2.

11. (Withdrawn) The method of claim 10, wherein said at least one fluorocarbon is at least one member selected from the group consisting of CF_4, CHF_3, and CH_2F_2.

12. (Withdrawn) The method of claim 1, wherein said method is performed without forming an etch stop.

13. (Withdrawn) The method of claim 2, wherein said side wall spacers remain unetched during formation of said self-aligned contact opening.

14. (Canceled).

15. (Withdrawn) The method of claim 9, wherein said at least one fluorocarbon and said ammonia are flowed into a reaction chamber containing said semiconductor device such that the flow rate ratio of said at least one fluorocarbon to said ammonia is not less than about 3:1.

16. (Withdrawn) The method of claim 15, wherein the flow rate ratio of said at least one fluorocarbon to said ammonia is within the range of about 3:1 to about 20:1.

17. (Withdrawn) The method of claim 16, wherein said flow rate ratio is within the range of about 4:1 to about 10:1.

18. (Withdrawn) The method of claim 11, wherein said at least one fluorocarbon is at least two members selected from the group of CF_4, CHF3, and CH_2F_2.

19. (Withdrawn) The method of claim 18, wherein said at least one fluorocarbon comprises CF_4, CHF3, and CH_2F_2.

20. (Withdrawn) The method of claim 11, wherein said at least one fluorocarbon is CF_4 which is flowed into a reaction chamber at a flow rate of about 15 to about 20 sccm.

21. (Withdrawn) The method of claim 18, wherein said CF_4 is flowed into a reaction chamber at a flow rate of about 18 sccm.

22. (Withdrawn) The method of claim 11, wherein said at least one fluorocarbon is CHF_3 which is flowed into a reaction chamber at a flow rate of about 35 to about 45 sccm.

23. (Withdrawn) The method of claim 22, wherein said CHF_3 is flowed into a reaction chamber at a flow rate of about 40 sccm.

24. (Withdrawn) The method of claim 11, wherein said at least one fluorocarbon is CH_2F_2 which is flowed into a reaction chamber at a flow rate of about 10 to about 15 sccm.

25. (Withdrawn) The method of claim 24, wherein said CH_2F_2 is introduced at a flow rate of about 13 sccm.

Claims 26-35 (Canceled).

36. (Previously presented) A process for forming an opening in an insulative layer formed over a substrate in a semiconductor device, said process comprising:

forming a pair of adjacent gate stacks over said substrate;

forming sidewall spacers on sidewalls of said adjacent gate stacks;

forming an insulative layer over said substrate;

forming a patterned photoresist mask layer over said insulative layer; and,

etching an opening in said insulative layer defined at least in part by said sidewall spacers through an aperture in said patterned resist layer, wherein said opening is etched through to said substrate using a combination consisting essentially of ammonia and at least one fluorocarbon, wherein said at least one fluorocarbon is selected from the group consisting of C_4F_8, C_4F_6, C_5F_8, CF_4, C_2F_6, CHF_3, CH_2F_2 and C_3F_8, and wherein the flow rate ratio of said at least one fluorocarbon to said ammonia is from about 2:1 to about 40:1, and wherein the step of etching an opening in said insulative layer forms a protective layer on said sidewall spacers that is from about 5 to about 50 Å thick.

37. (Previously presented) The method of claim 36, wherein said etching is performed to produce a self-aligned contact opening in said insulative layer, said

opening is self-aligned between said adjacent gate stack structures with sidewall spacers.

38. (Previously presented) The process of claim 36, wherein said etching is performed in a reaction chamber.

39. (Previously presented) The process of claim 38, wherein said at least one fluorocarbon and said ammonia are flowed into said reaction chamber such the flow rate ratio of said at least one fluorocarbon to said ammonia is not less than about 3:1.

40. (Canceled)

41. (Previously presented) The process of claim 36, wherein said flow rate ratio is within the range of about 4:1 to about 10:1.

42. (Original) The process of claim 36, wherein said etching is performed without forming an etch stop.

43. (Previously presented) The process of claim 42, wherein said opening is formed between said sidewall spacers on said pair of adjacent gate stacks.

44. (Original) The process of claim 43, wherein said etching is performed at a temperature within the range of about -50 to about 80 degrees Celsius.

45. (Original) The process of claim 44, wherein said etching is performed at a temperature within the range of about 0 to about 80 degrees Celsius.

46. (Original) The process of claim 45, wherein said method further comprises removing said photoresist mask layer after said etching.

Claims 47-63 (Canceled).

64. (Previously presented) A method of forming a conductive plug between adjacent gate stacks with sidewall spacers and inside a self-aligned contact opening formed in an insulative layer provided over a substrate in a semiconductor device, said method comprising:

contacting said insulative layer with a plasma etchant mixture consisting essentially of ammonia and at least one fluorocarbon at a temperature within the range of from about -50 to about 80 degrees Celsius so as to form a self-aligned contact opening defined at least in part by said sidewall spacers on adjacent gate stacks in said insulative layer without an etch stop, wherein said contacting further forms a protective layer over opposed sidewall spacers which have been formed over said adjacent gate stacks that is from about 5 to about 50 Å thick, wherein the flow rate ratio of said at least one flurocarbon to said ammonia is from about 2:1 to about 40:1, and said flow rate of said ammonia is at least about 2 sccm; and,

depositing a conductive plug inside said etched opening such that said conductive plug is separated from said sidewall spacers by said protective layer.

65. (Original) The method of claim 64, wherein said contacting is performed by flowing said ammonia over said device in a reaction chamber at a flow rate within the range of about 2 sccm to about 6 sccm.

66. (Previously presented) The method of claim 64, wherein said at least one fluorocarbon is at least one member selected from the group consisting of C_4F_8, C_4F_6,

C_5F_8, CF_4, CHF_3, and CH_2F_2 and is flowed over said device at a flow rate within the range of about 10 sccm to about 45 sccm.

67. (Original) The method of claim 66, wherein said mixture comprises at least two fluorocarbons and said flow rate ratio of each said fluorocarbon to said ammonia is within the range of about 3:1 to about 20:1.

68. (Original) The method of claim 67, wherein said mixture comprises three fluorocarbons and said flow rate ratio is within the range of about 4:1 to about 10:1.

69. (Original) The method of claim 64, wherein said protective layer is a nitrogen containing layer.

70. (Original) The method of claim 64, wherein said temperature is a pedestal temperature and said range is from about 0 to about 50 degrees Celsius.

IX. EVIDENCE APPENDIX

Evidence Involved in the Appeal of Application Serial No. 09/752,685

No evidence is being submitted.

X. RELATED PROCEEDINGS APPENDIX

Related Proceedings Involved in the Appeal of Application Serial No. 09/752,685

No related proceedings are referenced and therefore, no copies of decisions in related proceedings are provided.